

The Status of

Connecticut's Compliance

with

Enhanced 9-1-1

By Jennifer Herz

Introduction

Enhanced 911 (E 911) is a program regulated by the Federal Communications Commission (FCC). The goal of this program is to increase the amount of information that a 911 operator is able to provide to first responders. There are three different types of phone systems E 911 is expected to control including, wireline, voice over internet protocol (VoIP) and wireless. Each of the three types of phone services are accompanied by unique challenges in the implementation of the E 911 program.

A wireline phone is the traditional land line phone that most households use. The wireline service began E 911 implementation late in 1987. By 1989 wireline phone systems were able to relay information using automated location identification (ALI). ALI provides the address, phone number and depending on whether it is a residence or business the proper name and type of business.

A VoIP phone system uses a modem connection as the phone-line; a commonly known VoIP provider is Vonage which uses a broadband connection. Since a VoIP user only requires an internet connection they are able to choose any area-code for their phone number and customers may take their phone number with them when they travel. For example, this allows a VoIP user in Connecticut to have a California area code and use the same phone number in any state. This poses a problem since all emergency service users dial 911 and the Public Safety Answering Point (PSAP) identifies the caller by a specific code assigned in accordance with where the phone number originated. However, since VoIP users are able to use any area code they wish, the location of the phone number represents may not be the actual location of the caller. VoIP providers have made an effort to educate their customers as to the issues surrounding using a telephone number that is not representative of your actual location.

Additionally, since VoIP users can travel with the same phone number providers advise customers to register all changes of address. Yet, most users do not change their address when they go on vacation or take other trips. Furthermore, when a VoIP call is routed to the PSAP where the phone number originated, but not the actual location of the user, the PSAP is not able to quickly transfer the call. Each PSAP does have a non-published phone number that is unique to their location; however no master list of these un-published phone numbers exists. Therefore, a significant amount of time is wasted in re-routing the phone call to the appropriate PSAP.

The third type of system is wireless, commonly known as cell phones. Wireless systems are currently undergoing two phases of E 911 implementation. Since the Council has jurisdiction over wireless facilities the remainder of this report will focus on wireless systems implementation of E 911.

The FCC has set out two phases for the wireless program and specified requirements for each of the phases. The requirements for this program are based on the type and amount of information the (PSAP) must provide to the first responders.

Phase I of this program was available to Connecticut residents beginning in 2002. Phase I requirements included identifying the cellular phone number from which the call was received as well as the tower from which the call was transmitted. The implementation of Phase II requirements commenced in the first quarter of 2004. Phase II requirements further require that PSAP's be able to identify the latitude and longitude of every cellular phone caller within a prescribed amount of meters.

The addition of new technology, including a geographic information system (GIS) has enabled the PSAP's to meet the requirements of the FCC. This equipment facilitates the PSAP by providing them with the technology to map the location of a caller who may not know his/her

address. Currently, all of the 107 PSAP locations in Connecticut are equipped with this upgraded technology.

How it Works

Currently, Connecticut has 107 Public Safety Answering Points (PSAP's). A PSAP is the answering center for all 911 calls. The PSAP locations are predominantly located in central and southwest Connecticut. The northwest, southeast and northeast sections of the state utilize regional PSAP locations, which total 9 regions. (See map 1).

Today, there are four types of technologies available to provide cell phone service including, Code Division Multiple Access (CDMA), Global Systems for Mobile Communication (GSM), Integrated Digital Enhanced Network (iDEN) and Time Division Multiple Access (TDMA). The most recently developed and the fastest growing technology is CDMA. This technology allows for the elimination of common problems such as busy signals, dropped calls, cross talk and background noise. Additionally, CDMA will allow for lighter cell phones and a longer battery life. This technology is especially effective in busy and hilly areas.

The GSM technology is also commonly used and is specifically known for advances in SMS (text-messaging) and global roaming. Today, GSM is replacing TDMA technology which is the proto-type it was based on. TDMA is outdated; its use is decreasing and will be phased out in the future.

The fourth type of technology, iDEN, is employed by Motorola. It is used for two-way radios and often in conjunction with speaker phones.

Carriers in Connecticut use an array of the four technologies available. For example, some providers will use more than one technology on the same tower. Also, carriers can change

the type of technology they use on the towers if they choose. A second factor that affects the type of technology the carriers use is the type of license the FCC has issued the carrier. The FCC awards cellular and personal communication service (PCS) licenses or both. The type of license the carrier has will also affect their choice of technology.

As of the 2005 annual report submitted by OSET cellular companies operating in Connecticut employed the following types of technologies: Cingular Wireless and AT&T Wireless use GSM and TDMA technology; T-Mobile uses GSM, Nextel uses iDEN and Sprint as well as Verizon uses CDMA.

Below in the compliance section there will be further discussion regarding which technology is best used for purposes of E 911.

Money Matters

The Office of Statewide Emergency Telecommunications (OSET) annually determines the budgetary needs of the E 911 program. In order to meet the budget requirements of the E 911 program each wireless customer is assessed a fee. The Department of Public Utility Control (DPUC) utilizes the OSET budget to determine the amount each wireless customer will have to pay. The cellular companies administer the fee by adding the respective charge on every phone bill. After the cell phone companies collect the fees paid by customers, the money is then sent to OSET. The surcharge amount varies in accordance with the number of lines a user has. (See Table 12). The assessment, for a single line in 2005 was \$0.37 per month and the charge amount decreases as more phone lines are added. For example, a person with 6-10 lines would pay \$.019/line, and a person with 100 or more lines would be charged \$0.07/line. For lines to be assessed in accumulation they must be on the same bill. For example, a household that uses a

wireline (landline) and wireless phone would be assessed a lower surcharge for multiple fees if both of the services appeared on the same bill. However, if a user has different carriers for the cellular and wireline phones then they will be assessed the single line fee even though they actually have more than one line.

The fees accumulated from cellular customers are placed into the E 911 budget which is used exclusively for E 911 implementation. A Federal report issued in March of 2006 by the United States Government Accountability Office entitled, “States’ Collection and Use of Fund for Wireless Enhanced 911 Services”, questioned the actual use of state imposed E 911 fees. The report stated that Connecticut use all E 911 revenue to support the E 911 program. Additionally the same report showed that Connecticut’s assessments to cellular customers are low compared with other states. Wisconsin came in at the highest rate, charging \$3.00/month and Washington charges the least amount, at \$0.20/month. Both Vermont and Missouri use funds other than from customers to implement the E 911 program.

The Connecticut budget requirements for the E911 program for fiscal year 2005-2006 (FY 05/06) was about \$19.4 million. The actual cost of FY 05/06 was about \$16.7 million, due to roughly a \$2.7 million carryover from fiscal year 2004-2005 (FY 04/05). (See Table 3). The budget requirements for fiscal year 06-07 (FY 06/07) are about \$26.6 million. The estimated actual cost of FY 06/07 is projected to be \$17.7 million due to about \$8.8 million carryover from FY 05/06. (See Table 5).

The most recent budget for FY 06/07, submitted by the Office of Statewide Emergency Telecommunications, contains 14 items. The items outline the needs of the E 911 program and include direct funding for municipalities in addition to funding for first responders.

Refer to Table 3 and Table 5 for an overview of the detailed budget set out below.

Equipment/Enhancement

The most significant cost to this portion of the budget was a CPE software platform which totaled \$5,000,000 of the \$6,369,143.40 budget. CPE software is a new program which assists with call handling, making it more efficient. This portion of the budget also funds technology such as translation services and replacement of out dated headsets.

Regional Emergency Telecommunications

There are eight regions, each encompassing a number of cities/towns, which received funding including; Colchester EC, Groton ECC, Litchfield County Dispatch, Northwest Public Safety, Quinebaug Valley ECC, Tolland County Mutual Aid, Valley Shore, and Willimantic Switchboard. All of these regions contain one PSAP location which services a large area. (See Map 1). The areas with regional PSAP's usually rely on volunteer-fire based services.

Connecticut General Statutes § 28-24-3 states that the Public Safety office should provide support service to state and local police as well as fire and medical emergency services. Of the eight regions Quinebaug Valley ECC, with an estimated population in 2004 of 98,658 receives the most amount of funding, totaling about \$741,000. The region with the highest population was Tolland County Mutual Aid at 112,593 and they received the second highest amount of funding. The region with the lowest population, 32, 318 and the least funding, \$84,440 was the Willimantic Fire Switchboard. The total assessment for this category is \$2,782,222.52.

Cities with population over 40,000

There are 22 cities in Connecticut with a population that exceeds 40,000. The city of Bridgeport has the highest population at 140,132 however receives one of the lowest subsidies, about \$29,000. Hartford has the second highest population and receives the most funding, at about \$629,000. This category increased in FY 06/07 because New Haven and Norwalk

combined emergency communications to make them eligible for funding under this category. The total funding for this item is about \$3,187,000.

New Regionals

This category describes a group of presently stand-alone PSAP's that may form a new regional in the future. This can only be estimated since the new regional communications center has not yet been identified. The description in the budget for this item only describes the towns by population without identifying the town's name. The total for this item is \$385,388.

Network costs

This category includes the costs of AT&T network and database services. AT&T receives about \$3,000,000 for network services and database management. The services and management item includes: ISDN lines, computer services, tandem connections, and support services. Phase I services performed by wireless carriers receive two types of subsidies; a one time reimbursement of \$500,000 and an annual reimbursement of \$800,000 for services performed. Accuracy testing is also reimbursed for about \$100,000.

Secondly this item includes the costs for a public safety data network as well as a Telecommunications Service Priority System (TSP). The public safety data network would allow all public safety agencies access to public safety data. This program is estimated to cost \$3,000,000. In case of a malfunction TSP is a program that would have the ability to prioritize the reinstatement of telecommunication services at a cost of about \$100,000. The total of this item is about \$7,558,200.

Transition grants

This category is also estimated. This item projects that five PSAP's which currently stand alone will join together to form a region. There is currently a \$250,000 cap for each PSAP

to receive when forming a regional center. Assuming that all five PSAP's receive the most amount of money the total for this item is \$1,250,000.

CMED subsidy

Coordinated Emergency Medical Direction or CMED, coordinates dispatches for large geographic areas. The funding for this item is based on an allotment per capita for each town in the state. In FY 06/07 the funding per capita increased from \$0.15 to \$0.30. The total funding for this item is about \$1,052,000.

OSET

Office of Statewide Emergency Telecommunications (OSET) budget is accounted for by two major items including salary and overhead/fringe costs. The salary portion totals about \$713,000. The overhead/fringe costs include traveling and training, equipment and vehicles for a total of over \$1,000,000. The total amount OSET receives is roughly \$1,172,000.

EMS

This portion of the budget is required by Connecticut General Statutes § 28-24-7 which states that the Department of Public Health should collect Emergency Medical Services (EMS) data. This subsidy which totals \$250,000, is designated to support such data collection.

Training and public education

This item includes \$30,000 for Emergency Medical Dispatch (EMD) training and \$207,000 for public safety telecommunicator training. Additionally, this item includes \$200,000 for 911 education in schools. The total of this item is about \$457,300.

Multi town PSAP's

This item was first incorporated into the budget in FY 05/06. In the current fiscal year it receives funding per Connecticut General Statutes § 25-24-3. A PSAP qualifies for funding

from this item if it handles 911 calls for two municipalities. There are four groupings of municipalities which include the following: Middletown and Portland; Ledyard and Preston; East Granby and Granby; and Farmington and Burlington. This budget item equals about \$288,000.

CSP

The Connecticut State Police (CSP) received funding for the first time in FY 05/06. CSP receive about one third of all 911 calls in the state, yet prior to 2005 they were not designated funding from the E 911 budget. The formula to determine the amount that should be delegated to the CSP is based on a \$1.00/911 phone call calculation. All funds distributed to CSP must be used for E 911 services. There are eight troops, which receive a total of \$811,968. (See Map 1 for location of each CSP troop).

PSAP Training

This subsidy is used solely to provide training to telecommunicators. The amount of funds distributed is based on a \$0.10 per capita formula calculated for each town based on Department of Public Health's population estimates. This item accounts for about \$350,000.

Capital expenses

Capital expenses are divided into three categories. The formula used to calculate the amount of the subsidy is based on a formula of 12.5% of the total funding. The regional communication centers receive \$2,786,507 in total funding, and therefore receive \$348,313 for capital expenses. Cities with a population in excess of 70,000 receive \$1,741,324 in total funding and \$217,665 for capital expenses. Cities with a population over 40,000 receive \$1,314,917 in total funding and \$164,343 for capital expenses. Additionally, any city which

request capital expense funds must also match the funds received, dollar for dollar, from local funds before they are awarded. The total of this item is approximately \$730,343.

Who is Using E 911?

In 2005, of the 2.6 million 911 calls processed by PSAP's in Connecticut, 64% of them were placed from cellular phones. The number of calls placed from cellular phones in 2000 equaled 935,730 calls and the amount of cellular-based 911 calls in 2005 reached 1.66 million. The significant increase in usage has served as a signal to the Department of Public Safety that this mode of getting emergency attention is vital to successful emergency responses.

(See Table 1).

Compliance

There are two phases that the FCC has delineated to reach the goals of E 911. Phase I has effectively reached 100% compliance in Connecticut. Phase I required identification of the caller's phone number as well as the closest tower to the caller. Phase II requires the correct latitude and longitude of the caller. Although implementation of Phase II has begun, it is not yet completed. Connecticut is in step with surrounding state's implementation of each phase of the E 911 program. (See Map 2).

The requirements of Phase II depend on the type of technology the cellular carrier implements, either handset or network based. As of the most recent report, the 2005 annual report from Department of Public Safety (DPS), cellular carriers are not within the Phase II requirements of the FCC. Connecticut carries are able to locate a caller's longitude and latitude, but the percentage of accurate calls falls below the standards outlined by the FCC.

In 2005 DPS conducted a study to test the accuracy of cellular carriers in Connecticut. Connecticut is the only state to conduct such a test. The study tested all six of the wireless carriers in the state at 450 random sample locations including; Sprint, Cingular, AT&T, Nextel, T-Mobile, and Verizon. The study compared the results received through the cellular phone with actual latitude and longitude. The study included two types of wireless technology including, handset technology and network technology.

Handset technology utilizes GPS satellites through a computer chip and is required to be accurate within 50 meters 67% of the time and accurate within 100 meters 95% of the time. Handset technology is used by Nextel, Sprint PCS and Verizon Wireless.

The handset-based technology test results were more accurate than the network based tests. In the 50 meter test Nextel was the only carrier to meet the FCC requirement. Sprint PCS did not meet the requirement by .02% and the carrier with the lowest percentage, Verizon Wireless, measured at 54.10%. (See Table 2). All three carriers were below the required 95% threshold for the 100 meter test. Again, the test results for the 100 meter threshold show Nextel with the highest ranking at 77.58%, while Sprint PCS tested at 71.60% and Verizon tested at 68.52%. (See Table 2).

Network based technology is based upon a triangulation scheme where the cell phone signal is located based on signals received from a number of cellular towers. The network-based technology carrier's overall test results showed lower compliance results than the handset-based technology. T-Mobile had the best showing in both the 100 and 300 meter categories and AT&T Wireless had the lowest percentage in both categories. None of the network based tests showed any of the carriers in compliance or significantly close to the compliance threshold. (See Table 4).

Among the four technologies utilized by cellular carriers, including iDen, CDMA, GSM, and TDMA, Nextel's use of iDen resulted in the most accurate testing. Nextel handset technology, using iDen accurately identified 75% of the caller's latitude and longitude within zero to fifty feet. CDMA technology also showed promising test results with almost 67% of Sprint's handset based calls within zero to fifty meters of accuracy. Cingular network based calls showed the least accurate testing using GSM technology, nearly reaching 37% accuracy within zero to one-hundred meters. (See Tables 6, 8, 9, 11 and 13).

What is Next?

After the Department of Public Safety (DPS) compiled and distributed its report it notified the carriers that were not in compliance with the FCC guidelines. The carriers were told to fix their systems so that they would meet the FCC guidelines and DPS made the carriers aware that they are planning on re-testing at some point in the future.

OSET has also commenced discussions with the FCC concerning enforcement of the guidelines that the FCC has published. Currently, it is not clear whether the FCC has the power to enforce the guidelines they have set out.

The cellular companies have come forward with multiple reasons for lack of compliance with FCC guidelines. Many carriers possess the technology to meet the requirements but for an undisclosed reason were not using such technology. Some carriers stated that they simply did not have their system which supports E 911 calls "on" at the time of the testing. Carriers have contacted the DPS and stated that after receiving the test results have "turned on" the appropriate system.

However, the criterion established by the FCC has also come under criticism. The guidelines were formed in 1994 and one school of thought is that the technology available at that time did not allow for the accurate formation of guidelines. The critics say that the current thresholds are impossible to meet with the technology presently available.

Cellular carriers also point to the use of outdated cellular phones as a reason for non-compliance. However, this problem is not reflected in the study since the study used up-to-date cellular phones. Moreover, the use of outdated phones is much more prevalent in the southern portion of the nation, rather than the northeast.

Conclusion

The E 911 program in Connecticut is in a respectable place compared with the rest of the country. All of the funds marked for the program are going directly to its implementation. Additionally, Connecticut is the only state to take the pro-active step of testing the carriers. Phase II implementation of E 911 must be pursued further. The compliance with the FCC guidelines will depend on a number of factors including the system technology of the carriers and the establishment of reasonable guidelines. DPS continues to strive to meet the requirements of the FCC for Phase II of the E 911 program.

Sources

2005 Annual Report to the General Assembly, Concerning Enhanced 9-1-1 Emergency Telephone Service. Office of Statewide Emergency Telecommunications, Department of Public Safety.

Enhanced 9-1-1 Wireless Phase II Accuracy Testing. January 25, 2006. Office of Statewide Emergency Telecommunications, Department of Public Safety Division of Fire Emergency and Building Services.

Estimated Requirements for the Operating Budget of the Statewide Enhanced 9-1-1 Program. Fiscal Year 06/07, Budget Narrative. Office of Statewide Emergency Telecommunications, Department of Public Safety.

Telecommunications: States' Collection and Use of Funds for Wireless Enhanced 911 Services. March 2006. United States Government Accountability Office, Report to Congressional Committees.

The New England 700 MHz Regional Plan Region 19. June 2004, revised December 2004.

<http://www.fcc.gov/911/enhanced/>

www.ct.gov/dps

<http://cellphones.about.com>

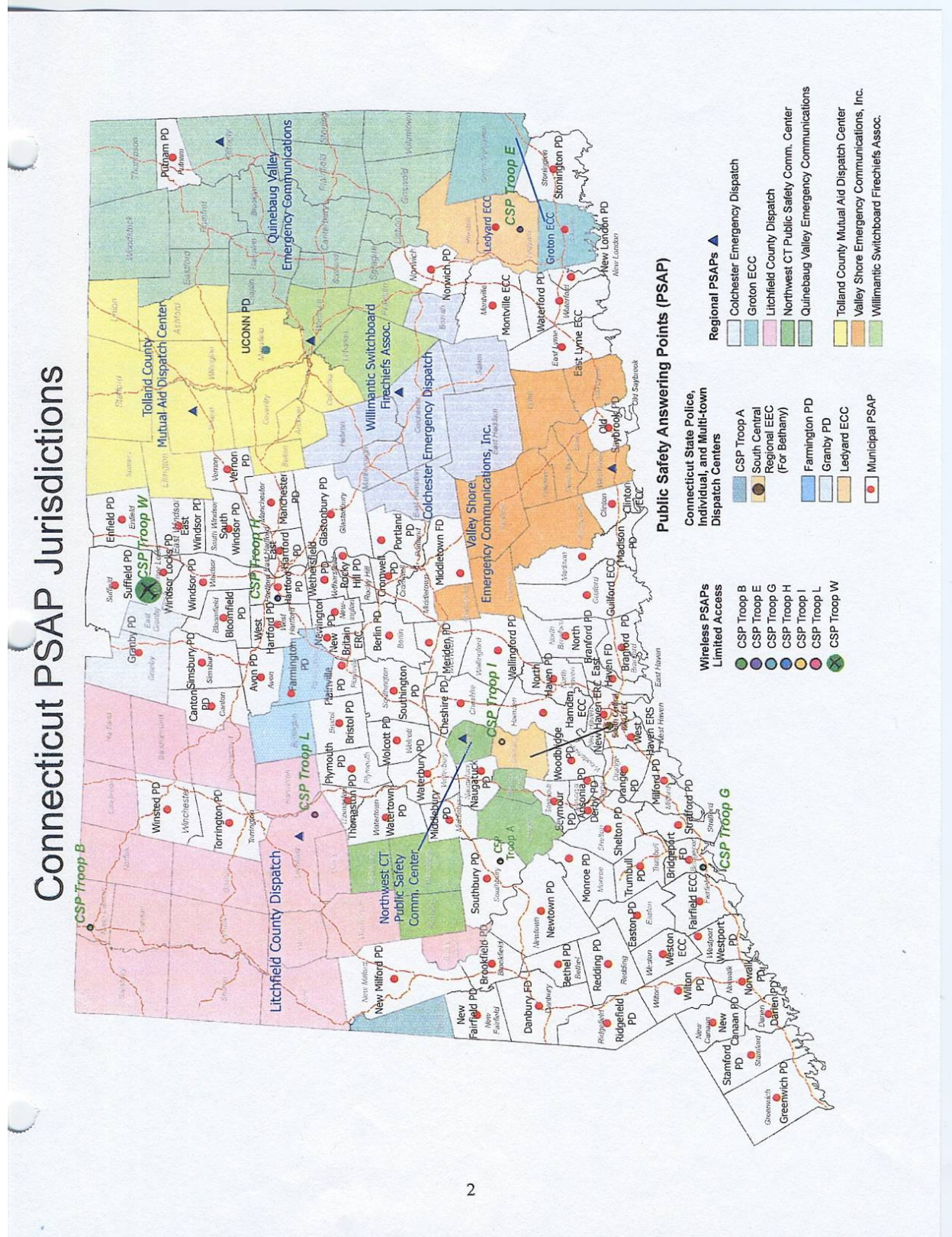


TABLE 1

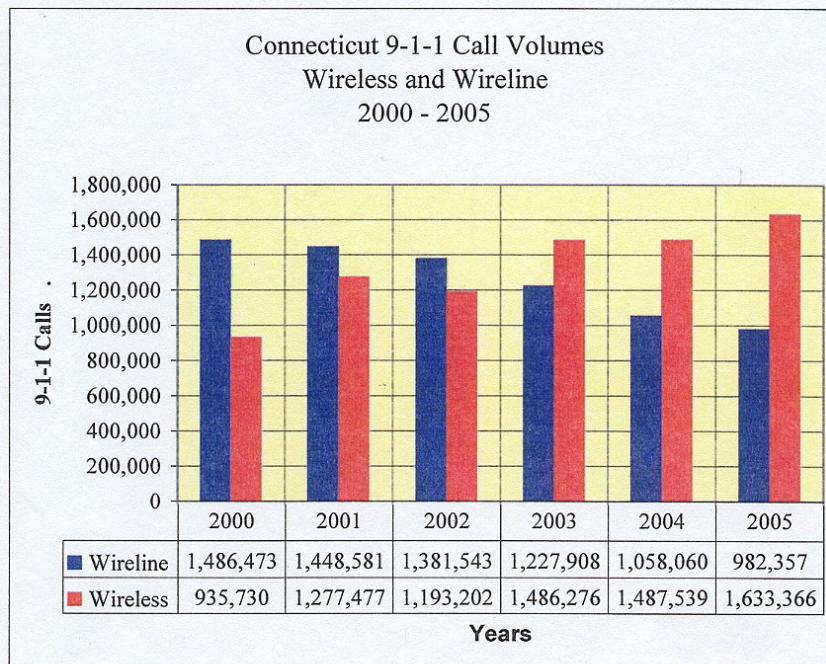
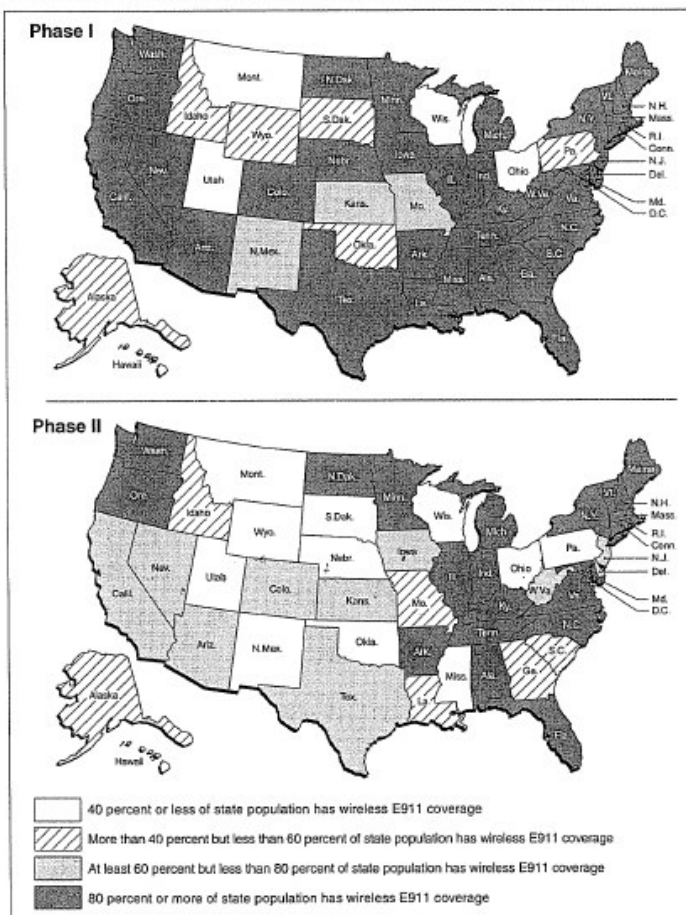


Figure 2: Percentage of State Population That Has Phase I and Phase II Wireless E911 Coverage with at Least One Wireless Carrier as of January 2006



Source: GAO analysis of NENA data.

TABLE 2

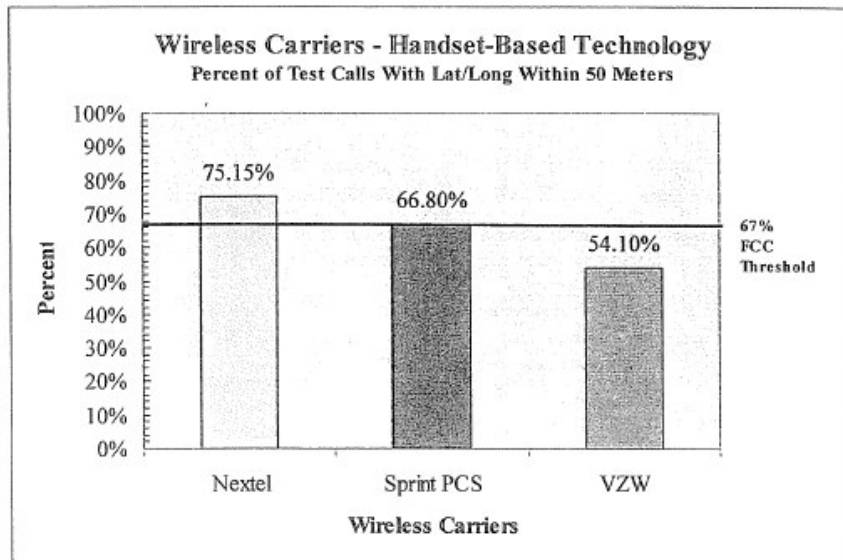
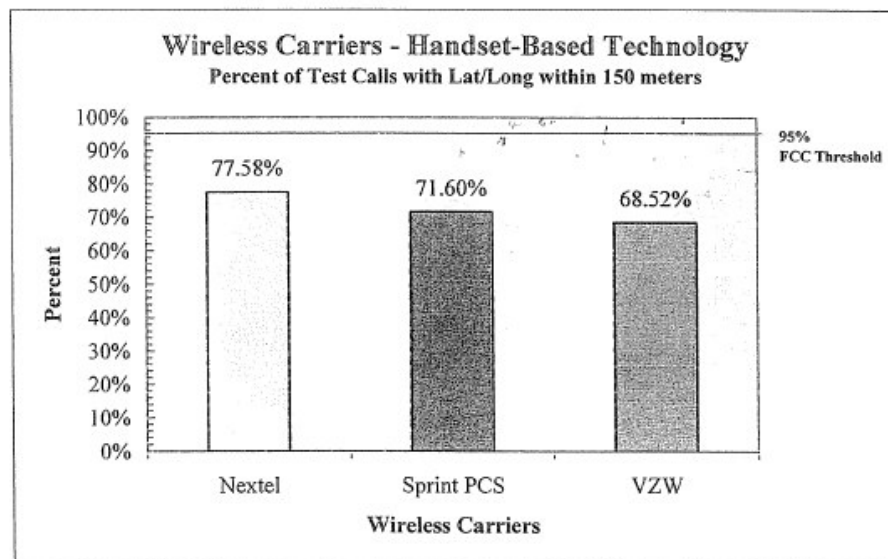


TABLE 3



State of Connecticut Department of Public Safety, Office of Statewide Emergency Telecommunications
2005 Annual Report for the General Assembly Concerning Enhanced 9-1-1 Telephone Services

E911 TELECOMMUNICATIONS FUND REQUIREMENTS FOR FY 05/06

SUMMARY DATA ALL ITEMS

Budget Item	FY 05/06 Requirements	FY 04/05 Carryovers	FY 05/06 Actual Cost
Item 1: New Equipment	\$1,165,143.40	\$255,000.00	\$910,143.40
Item 2 : Regionals	\$2,394,091.58	\$0.00	\$2,394,091.58
Item 3: City Subsidy	\$955,193.50	\$0.00	\$955,193.50
Item 4: New Regionals	\$242,820.00	\$194,940.00	\$47,880.00
Item 5: Network Costs	\$7,899,785.00	\$1,000,000.00	\$6,899,785.00
Item 6: Transition Grants	\$1,250,000.00	\$157,888.94	\$1,092,111.06
Item 7: CMED Subsidy	\$1,045,017.00	\$0.00	\$1,045,017.00
Item 8: OSET Cost	\$986,146.97	\$3,000.00	\$983,146.97
Item 9: DPH Subsidy	\$250,000.00	\$0.00	\$250,000.00
Item 10: Training & Public Education	\$473,149.48	\$134,584.00	\$338,565.48
Item 11: Cities -Pop. over 40,000-New	\$1,058,567.40	\$0.00	\$1,058,567.40
Item 12: Multi-Town PSAPs - New	\$133,857.23	\$0.00	\$133,857.23
Item 13: CSP Subsidy - New	\$745,285.00	\$0.00	\$745,285.00
Item 14: PSAP Training Subsidy - New	\$347,672.60	\$0.00	\$347,672.60
Item 15: Capital Expenses - New	\$497,763.28	\$0.00	\$497,763.28
Item 16: Income/Interest	\$0.00	\$1,000,000.00	(\$1,000,000.00)
Budget Requirements	\$19,444,492.44	\$2,745,412.94	\$16,699,079.50

TABLE 4

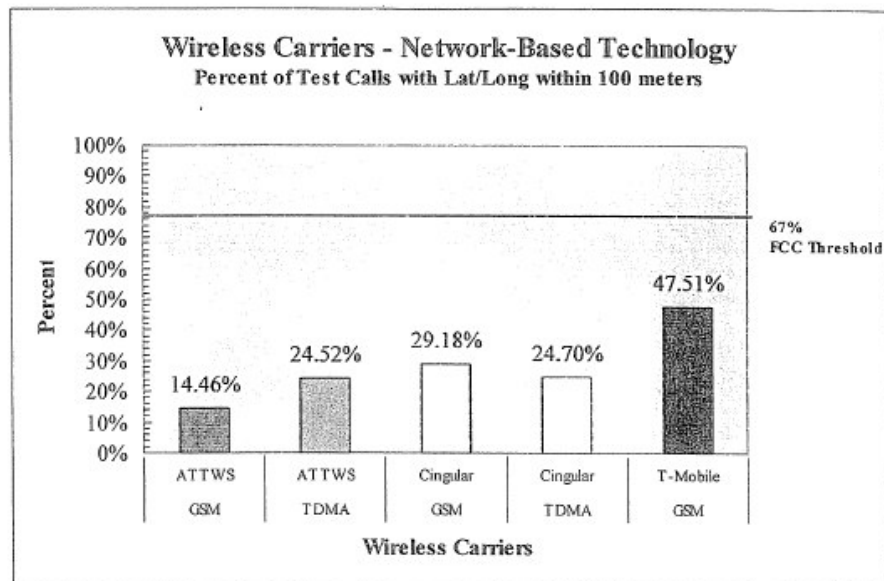
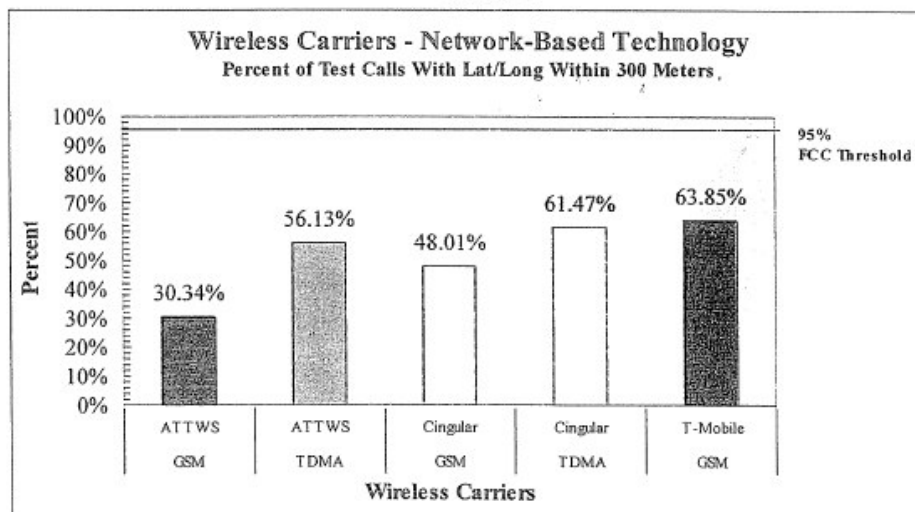


TABLE 5



Total Budget Requirements FY 2006-2007

<u>Budget Item</u>	<u>FY 06/07 Requirements</u>	<u>FY 05/06 Carryovers</u>	<u>FY 06/07 Actual Cost</u>
Item 1: PSAP Equipment	\$6,369,143.40	(\$514,202.78)	\$6,883,346.18
Item 2: Regionals	\$2,782,222.52	\$234,163.89	\$2,548,058.63
Item 3: City Subsidy	\$3,187,119.96	\$118,405.38	\$3,068,714.58
Item 4: New Regionals	\$385,388.00	\$47,880.00	\$337,508.00
Item 5: Network Costs	\$7,558,202.00	\$4,300,000.00	\$3,258,202.00
Item 6: Transition Grants	\$1,250,000.00	\$617,277.12	\$632,722.88
Item 7: CMED Subsidy	\$1,051,450.20	\$0.00	\$1,051,450.20
Item 8: OSET Cost	\$1,172,314.70	\$0.00	\$1,172,314.70
Item 9: DPH Subsidy	\$250,000.00	\$0.00	\$250,000.00
Item 10: Training & Public Education	\$457,340.00	\$186,537.00	\$270,803.00
Item 11: Multi-Town PSAPs	\$288,328.69	\$33,464.31	\$254,864.38
Item 12: CSP Subsidy	\$811,968.00	\$0.00	\$811,968.00
Item 13: PSAP Training Subsidy	\$350,010.40	\$347,672.60	\$2,337.80
Item 14: Capital Expenses	\$730,343.75	\$497,763.28	\$232,580.47
Item 15: Income/Interest		\$3,000,000.00	(\$3,000,000.00)
Budget Requirements	26,643,831.62	8,868,960.80	17,774,870.82

Handset Technology - Accuracy Of Phase II Latitude and Longitude Per Call

TABLE 6

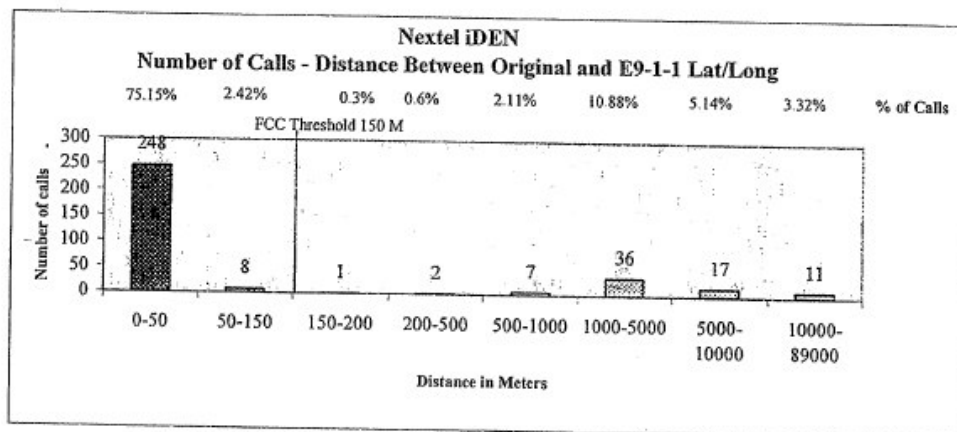
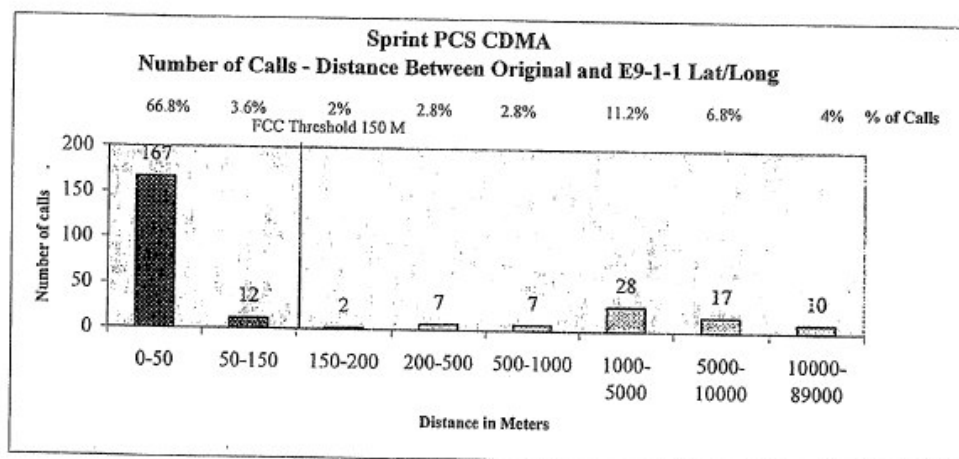
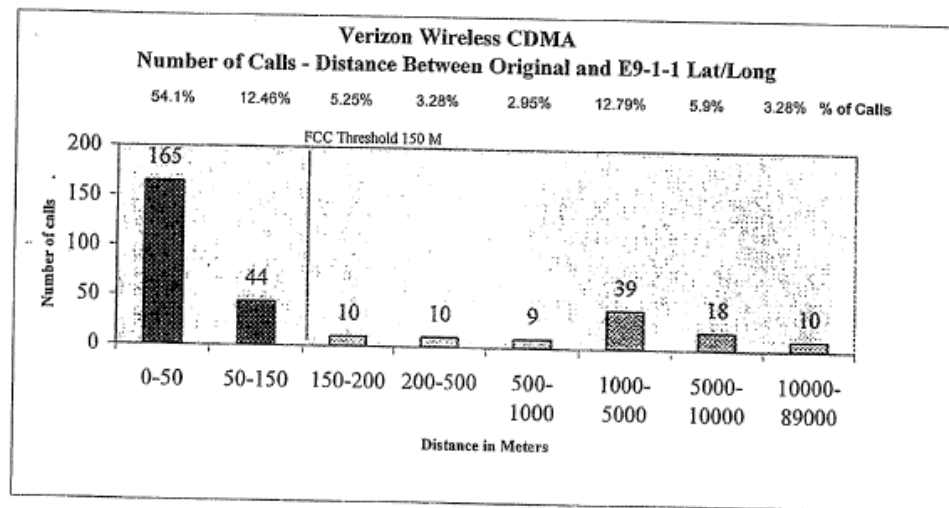


TABLE 7



Handset Technology - Accuracy Of Phase II Latitude and Longitude Per Call

TABLE 8



Network Technology Accuracy Of Phase II Latitude and Longitude Per Call

TABLE 9

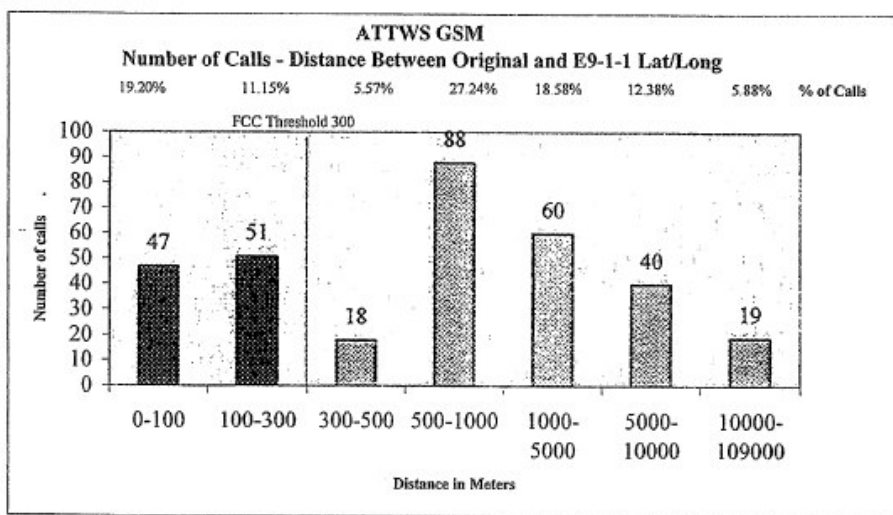
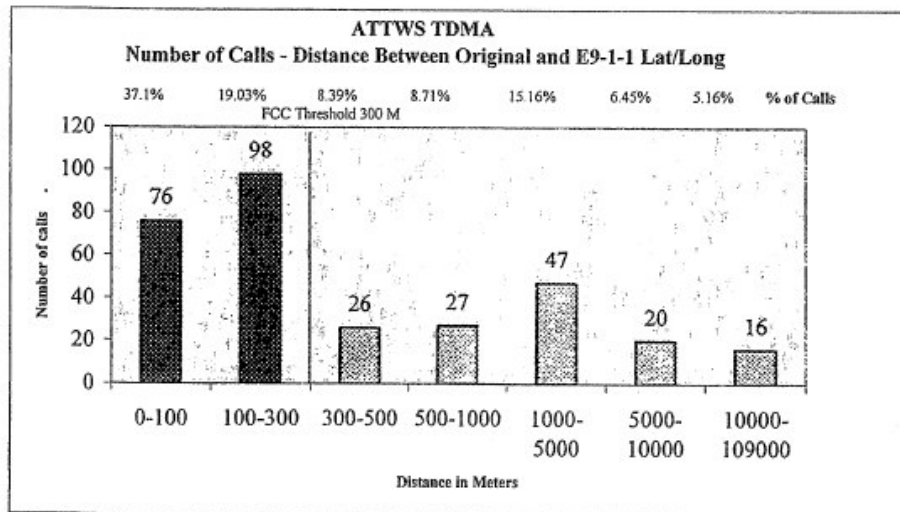


TABLE 10



Network Technology Accuracy Of Phase II Latitude and Longitude Per Call

TABLE 11

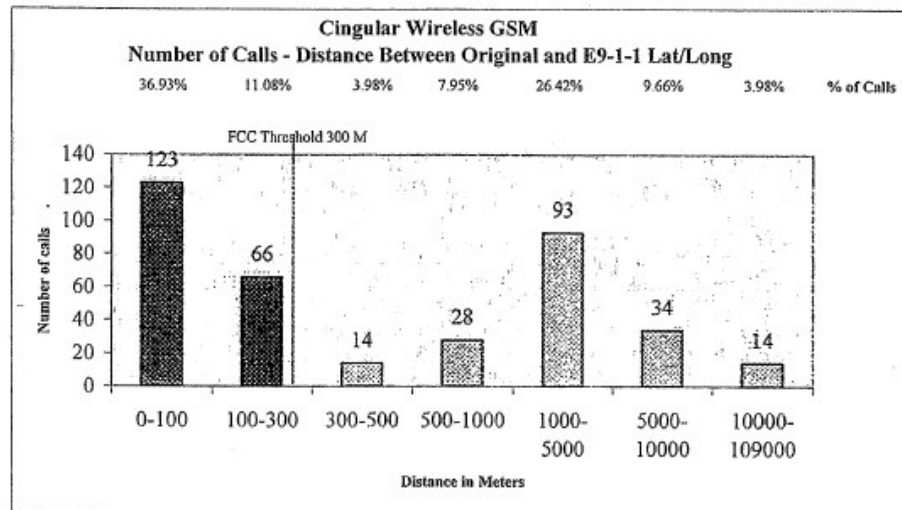
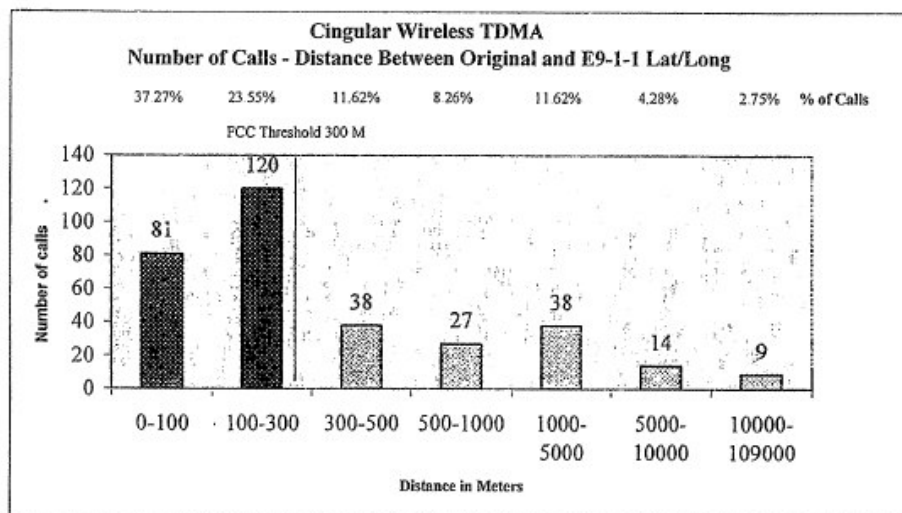


TABLE 12



E9-1-1 SURCHARGE

Every telephone customer with wireline or wireless service pays a monthly surcharge on their telephone bill to underwrite the costs of E9-1-1 services to the State. Telephone companies collect these fees and remit them to the Office of Statewide Emergency Telecommunications (OSET) on a monthly basis. The Department of Public Utility Control (DPUC) determines the surcharge based on the E9-1-1 budget requirements determined by OSET.

In accordance with the provisions of the Regulations of the State of Connecticut Section 28-24-10, OSET submitted its operating budget for E9-1-1 service, and the implementation of Section 29-8-24-1 through 28-24-11 to the DPUC for fiscal year 2006-2007. The budget requirements resulted in setting the surcharge at 37 cents per month for a single telephone line for the period June 1, 2005 through May 30, 2006. There is a sliding scale for customers with multiple phone lines. The current surcharge rates are listed below.

Number of Lines	Per-Line Assessment
1	.37
2	.28
3	.25
4-5	.22
6-10	.19
11-25	.15
26-50	.12
51-99	.09
100+	.07

See Appendix A for the budget submitted to DPUC for fiscal year 2006-2007.

Network Technology Accuracy Of Phase II Latitude and Longitude Per Call

TABLE 13

